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To: MS RCE
Attn: Examiner Brian R. Peugh, Group Art Unit 2187
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Title of Document Transmitted: Response to Office Action dated 11/13/2006
Customer Assignment No. 027516
Serial No.:   10/601,030
Filed: 6/20/2003
In re Application of: Vartti et. al
Title: System and Method for Handling Memory Requests in
a Multiprocessor Shared Memory System
Docket No.:   RA-5482

It is believed no extension of time is required. However, if such an extension is required, please consider this a petition for an extension of time for a sufficient number of months to enter these papers. Please charge any fees or credit overpayment to Deposit Account No. 19-3790.

By: _Beth L McMahon_
Name: _Beth L. McMahon_
Reg. No:_41,987_

I hereby certify that this paper is being transmitted by facsimile to the U.S. Patent and Trademark Office on the date shown below.

Name: Beth McMahon

Beth L McMahon   _February 12, 2006_

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Group Art Unit: 2187
Examiner: Brian R. Peugh

February 12, 2007

Customer No.: 027516
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In re Application of: Vartti et. al
Title: System and Method for Handling Memory Requests in a Multiprocessor Shared Memory System

Docket No.: RA-5482

Commissioner for Patents
M.S. Amendment
PO Box 1450
Alexandria, VA 22313-1450

Amendment after Final Under 37 CFR §1.116

Dear Sir,

This is in response to the Examiner's Office Action that was mailed **11/13/2006**, setting a three (3) month shortened statutory period for response. It is respectfully submitted that this Amendment After Final places the Claims in condition for allowance in accordance with the Examiner's indication of allowable subject matter set forth in the Office Action.

It is believed no extension of time is needed. If any extension is required, please consider this a petition therefore. Charge the extension fee to Deposit Account No. 19-3790, along with any additional required fees.

CERTIFICATE OF MAILING (37 CFR 1.8(a))
I hereby certify that this correspondence is being transmitted via facsimile to (571) 273-8300 on the date shown below:

Beth F. McMahon   February 12, 2007
(Beth McMahon)   (Date)

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Serial No. 10/601,030, Docket No. RA-5482   Amendment after Final
Examiner Peugh, Group Art Unit 2187   February 9, 2007

Please amend the Claims as follows:

1   1.   (Currently Amended) For use in a system having multiple processors in a
2 processing node coupled to a memory, a method, comprising:
3   a.) receiving multiple requests for data from the multiple processors;
4   b.) if ones of the multiple requests are requesting the same data, creating
5 a respective linked list in the processing node to record the ones of the multiple
6 requests according to order of receipt, the linked list being created without regard
7 to types of the requests; and
8   c.) issuing an oldest one of the requests recorded by each linked list from
9 the processing node to the memory and:
10   d.) receiving from the memory requests that are issued to the multiple
11 processors requesting return of data to the memory, and if a request from
12 memory is requesting the same data as requests recorded within a linked list,
13 adding the memory request to the linked list.

      2. (Cancelled)

      3. (Cancelled)

1   4. (Original) The method of Claim 1, and further including:
2   receiving requested data from the memory;
3   if the received data was requested by requests recorded in a linked list,
4 providing the received data to a processor that issued a predetermined one of
5 the requests included in the linked list;
6   removing the predetermined request from the linked list; and
7   processing all requests remaining in the linked list.

1   5. (Original) The method of Claim 4, wherein the predetermined request is the
2 oldest-pending request in the linked list.

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1   6. (Original)   The method of Claim 4, wherein the processing step includes:

2   making the next request in the linked list the current request;

3   requesting return of the received data from whichever one of the multiple

4   processors last retained the data;

5   providing the received data to whichever one of the multiple processors is

6   indicated by the current request; and

7   removing the current request from the linked list.

1   7. (Original)   The method of Claim 6, wherein the memory issues memory

2   requests to the multiple processors for the return of data to the memory, wherein

3   a memory request requesting the same data as requests recorded by a linked list

4   is added to the linked list, and wherein the providing step includes providing the

5   received data to the memory if the memory is indicated by the current request.

1   8. (Original)   The method of Claim 7, wherein a shared cache is coupled to the

2   multiple processors, and further including:

3   attempting to retrieve the received data from the shared cache; and

4   if, in response to the requesting step, none of the multiple processors

5   returns the received data, the providing step includes providing any data

6   retrieved from the shared cache to whichever one of the multiple processors or

7   the memory is indicated by the current request.

1   9. (Original)   The method of Claim 8, wherein if, in response to the requesting

2   step, none of the multiple processors returns the received data, and if the

3   received data is not resident in the shared cache, indicating the current request

4   must be retried.

1   10. (Original) The method of Claim 9, wherein the step of receiving requested

2   data from the memory occurs before all invalidation operations are completed for

3   the received data, and further including preventing predetermined data from

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4   being provided to the memory until predetermined invalidation operations are

5   completed.

1   11. (Original) The method of Claim 6, wherein the requesting and providing steps

2   of Claim 6 are performed during an indivisible operation.

1   12. (Currently Amended)   A method of processing requests generated by

2   requesters and provided to a memory, including:

3   a.) receiving a request for data stored in the memory;

4   b.) if the request is requesting the same data as another pending request

5   that has not yet been provided from the requesters to the memory, linking the

6   request to the other pending request without regard to types of the requests and

7   before either of the requests is provided by the requesters to the memory; and

8   c.) repeating steps a.) and b.) for any additional requests issued to the

9   memory to create multiple linked lists of requests, each respectively associated

10   with different data;

11   d.) when data for a pending request is received from the memory,

12   providing the data to a requester that issued the pending request;

13   e.) if the pending request is linked to another request, requesting that the

14   data be returned by a requester indicated by the pending request so that the

15   other linked request may be processed;

16   f.) providing the data to satisfy the other linked request;

17   g.) making the other linked request the current request;

18   h.) if the current request is linked to another request, requesting that the

19   data be returned by a requester that most recently retained the data;

20   i.) repeating steps f.) through h.) for each of the additional requests in the

21   linked list; and

22   wherein at least one of steps e.) and h.) includes requesting that the data

23   is returned with predetermined access rights that are based on a type of the

24   current request and the linked request.

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1 13. (Cancelled)

1 14. (Cancelled)

1 15. (Cancelled)

1 16. (Cancelled)

1 17. (Cancelled)

1 18. (Currently Amended) ~~The method of Claim 16,~~ A method of processing
2 requests generated by requesters and provided to a memory, including:
3 a.) receiving a request for data stored in the memory;
4 b.) if the request is requesting the same data as another pending request
5 that has not yet been provided from the requesters to the memory, linking the
6 request to the other pending request without regard to types of the requests and
7 before either of the requests is provided by the requesters to the memory;
8 c.) repeating steps a.) and b.) for any additional requests issued to the
9 memory to create multiple linked lists of requests, each respectively associated
10 with different data;
11 d.) when data for a pending request is received from the memory,
12 providing the data to a requester that issued the pending request;
13 e.) if the pending request is linked to another request, requesting that the
14 data be returned by a requester indicated by the pending request so that the
15 other linked request may be processed;
16 f.) providing the data to satisfy the other linked request;
17 g.) making the other linked request the current request;
18 h.) if the current request is linked to another request, requesting that the
19 data be returned by a requester that most recently retained the data;
20 i.) repeating steps f.) through h.) for each of the additional requests in the
21 linked list; and

5

22   wherein at least one of steps e.) and h.) include requesting that the data is

23   returned with predetermined access rights based on rights that were granted by

24   the memory for the data.

1   19. (Currently Amended)   The method of Claim [16] **18**, wherein at least one of

2   steps e.) and h.) is performed in a manner that is determined programmably.

1   20. (Currently Amended)   A system for processing requests to a memory,

2   comprising:

3   multiple requesters to issue requests for data; and

4   a request tracking circuit to retain a record of each request until the

5   request is completed, and to the requesting tracking circuit including:

6   a storage device to store linked lists, each linked list to associate a

7   request with any other one or more requests for the same data irrespective of

8   types of the requests so that a single request from the multiple requesters for any

9   given data is pending within the memory at a given time; and

10   a control circuit

11   to receive data from the memory in response to a request

12   that has been associated with other requests;

13   to provide the received data to whichever requester issued

14   the oldest one of the associated requests for the received data as determined by

15   information stored within the storage device;

16   to process each of the other associated requests for the

17   received data in the order in which the requests were recorded by the request

18   tracking circuit by attempting to obtain the received data from one of the multiple

19   requesters;

20   to provide any obtained data to a requester that is identified

21   by the request that is being processed; and

22   to cause a requester to reissue a request if, during

23   processing of a request, data requested by the request could not be obtained.

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21. (Cancelled)

22. (Cancelled)

23. (Cancelled)

24. (Cancelled)

25. (Cancelled)

1   26. (Currently Amended)   ~~The system of Claim 24, wherein the request tracking~~
2   ~~circuit includes~~ A system for processing requests to a memory, comprising:
3   multiple requesters to issue requests for data; and
4   a request tracking circuit to retain a record of each request until the
5   request is completed, the requesting tracking circuit including:
6   a remote tracker circuit to store a record of a request received from
7   the memory that is requesting that same data as one or more requests recorded
8   within the request tracking circuit;
9   a storage device to store linked lists, each to associate a request
10   with any other one or more requests for the same data irrespective of types of
11   the requests so that a single request from the multiple requesters for any given
12   data is pending within the memory at a given time; and
13   a control circuit
14   to receive data from the memory in response to a request
15   that has been associated with other requests;
16   to provide the received data to whichever requester issued
17   the oldest one of the associated requests for the received data as determined by
18   information stored within the storage device;
19   to process each of the other associated requests for the
20   received data in the order in which the requests were recorded by the request

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21 <u>tracking circuit by attempting to obtain the received data from one of the multiple</u>

22 <u>requesters; and</u>

23 <u>to provide any obtained data to a requester that is identified</u>

24 <u>by the request that is being processed.</u>

1 27. (Currently Amended)   The system of Claim [25] <u>20</u>, wherein the control

2 circuit includes a circuit to process the request from memory by attempting to

3 obtain the requested data, then providing any obtained data to the memory.

1 28. (Currently Amended)   ~~The system of Claim 23,~~<u>A system for processing</u>

2 <u>requests to a memory, comprising:</u>

3 <u>multiple requesters to issue requests for data; and</u>

4 <u>a request tracking circuit to retain a record of each request until the</u>

5 <u>request is completed, the requesting tracking circuit including:</u>

6 <u>a storage device to store linked lists, each to associate a request</u>

7 <u>with any other one or more requests for the same data irrespective of types of</u>

8 <u>the requests so that a single request from the multiple requesters for any given</u>

9 <u>data is pending within the memory at a given time; and</u>

10 <u>a control circuit</u>

11 <u>to receive data from the memory in response to a request</u>

12 <u>that has been associated with other requests;</u>

13 <u>to provide the received data to whichever requester issued</u>

14 <u>the oldest one of the associated requests for the received data as determined by</u>

15 <u>information stored within the storage device; and</u>

16 <u>to process each of the other associated requests for the</u>

17 <u>received data in the order in which the requests were recorded by the request</u>

18 <u>·tracking circuit;</u>

19 <u>wherein the memory provides data to the request tracking circuit before</u>

20 <u>all invalidation operations for the data have been completed, and wherein the</u>

21 <u>request tracking circuit includes a circuit to prevent predetermined data retained</u>

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22   by predetermined ones of the multiple requesters from being returned to the

23   memory before all of the invalidation operations are completed.

1   29. (Currently Amended)   A data processing system comprising:

2   a memory;

3   a processing node coupled to the memory and having ~~one or more~~

4   ~~requesters~~multiple processors to generate requests for data to the memory,

5   wherein the processing node includes a requesting tracking circuit to associate

6   requests issued for the same data irrespective of request types, and to allow only

7   one of the requests for the same data from being issued to the memory at a

8   given time; and

9   a control circuit included in the processing node to receive data returned

10   from the memory, to provide the data to the processor associated with the oldest

11   request pending for the data, to determine whether other requests are pending

12   for the received data, and for each of the other pending requests, to process the

13   pending requests in order of receipt by attempting to obtain the data from

14   whichever of the multiple processors last retained the data, and to then provide

15   any obtained data to a processor that is associated with the request being

16   processed, the control circuit further to store programmable data to indicate the

17   manner in which the data is to be obtained from a processor based on access

18   rights retained by the processor for the data and the access rights requested by

19   the processor associated with the request being processed.

        30. (Cancelled)

1   31. (Cancelled)

        32. (Cancelled)

        33. (Cancelled)

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1   34. (Currently Amended)   A system for processing requests to a memory,

2   including:

3   processing means for originating the requests to the memory; and

4   request tracking means for receiving the requests, and for forming an

5   association between any of the requests that are requesting the same data

6   irrespective of types of the requests, the association between requests recording

7   an order of receipt of the requests, and for allowing only one of the associated

8   requests to be provided from the processing means to the memory; and

9   control means included in the request tracking means for receiving data

10 from the memory along with access rights required to process the request, and if

11 the received data was requested by associated requests that are requesting the

12 same data, for processing each of the associated requests in the order in which

13 the requests were received by providing the data to the processing means along

14 with the required access rights.

        35. (Cancelled)

        36. (Cancelled)

        37. (Cancelled)

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Serial No. 10/601,030   Office Action Response
Attorney Docket No. RA-5482   September 6, 2006
Examiner Brian R. Peugh, Group Art Unit 2187

Remarks

In the Office Action dated 11/13/2006 which was made Final ("Final Rejection"), Claims 1, 2, 4-6, 12-16, 19-24, 29-32 and 34-36 were rejected. Claims 3, 7-11, 17, 18, 25-28, 33 and 37 were objected to as being allowable if rewritten in independent form including all of the limitations of the base and any intervening Claims. The amendment set forth above amends the Claim to place them in condition for allowance in the manner indicated by the Examiner. It is therefore requested that this amendment be entered and the Claims be passed to issue.

1.   Claims 1, 2, 4-6, 12-16, 19-24, 29-32, and 34-36 were rejected under 35 USC §103(a) as being unpatentable over U.S. Patent No. 6,434,641 to Haupt et al. ("Haupt") in view of U.S. Patent No. 6,973,550 to Rosenbluth et al. ("Rosenbluth") and U.S. Patent No. 6,546,465 to Bertone ("Bertone").

Claim 1 has been amended to include limitations of Claim 3 and intervening Claim 2. Claim 3 was indicated by the Examiner as being allowable if rewritten in independent form to include all limitations of the base and any intervening Claims. Therefore, it is respectfully submitted that Claim 1 is now in condition for allowance.

Claims 2 and 3 have been cancelled.

Claims 4-11 depend directly or indirectly from Claim 1 and are allowable for the reasons set forth above in regards to Claim 1.

Independent Claim 12 has been amended to include limitations of dependent Claim 17 and intervening Claims 13 -16. Claim 17 is indicated by the Examiner as being allowable if rewritten in independent form to include all limitations of the base and any intervening Claims. Therefore, it is respectfully submitted that Claim 12 is now in condition for allowance.

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Office Action Response
September 6, 2006

Claims 13-17 have been cancelled.

Claim 18 has been amended to include all limitations of independent Claim 12 and intervening Claims 13 -16. Claim 18 is indicated by the Examiner as being allowable if rewritten in independent form to include all limitations of the base and any intervening Claims. Therefore, it is respectfully submitted that Claim 18 is now in condition for allowance.

Claim 19 has been amended to depend from Claim 18, and is allowable for the reason set forth in regards to Claim 18.

Independent Claim 20 has been amended to include limitations of dependent Claim 25 and intervening Claims 21-24. Claim 25 is indicated by the Examiner as being allowable if rewritten in independent form to include all limitations of the base and any intervening Claims. Therefore, it is respectfully submitted that Claim 20 is now in condition for allowance.

Claims 21-25 have been cancelled.

Dependent Claim 26, which was indicated as being allowable, has been rewritten in independent form to include all limitations of base Claim 20, and intervening Claims 21-24. Claim 26 is therefore allowable as current presented.

Dependent Claim 27 has been amended to depend from Claim 20, and is therefore allowable for the reasons set forth in regards to Claim 20.

Dependent Claim 28, which was indicated as being allowable, has been rewritten in independent form to include all limitations of base Claim 20, and intervening Claims 21-23. Claim 28 is therefore allowable as current presented.

Independent Claim 29 has been amended to include all limitations of dependent Claim 33 and intervening Claims 30-32. Claim 33 was indicated by the Examiner as being allowable if rewritten in independent form to include all limitations of the base and any intervening Claims. Therefore, it is respectfully submitted that Claim 29 is now in condition for allowance.

Claims 30-33 have been cancelled.

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Independent Claim 34 has been amended to include all limitations of dependent Claim 37 and intervening Claims 35-36. Claim 37 was indicated by the Examiner as being allowable if rewritten in independent form to include all limitations of the base and any intervening Claims. Therefore, it is respectfully submitted that Claim 34 is now in condition for allowance.

Claims 35-37 have been cancelled.

2.   Claims 3, 7-11, 18, 18, 25-28, 33 and 37 were objected to as being dependent upon a rejected base Claim, but are said to be allowable if rewritten in independent form. As discussed above, the amendment set forth above presents these Claims in independent form including all limitations of the base and intervening Claims. Therefore, it is requested that this amendment be entered, and the Claims be passed to issue.

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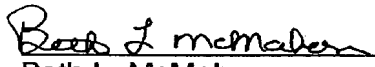Serial No. 10/601,030   · Office Action Response
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Conclusion

In the Office Action dated November 13, 2006, Claims 1, 2, 4-6, 12-16, 19-24, 29-32 and 34-36 were rejected and Claims 3, 7-11, 17, 18, 25-28, 33 and 37 were objected to. In the Amendment set forth above, Claims 3, 7-11, 17, 18, 25-28, 33 and 37 are rewritten in independent form to include all limitations of the base and intervening Claims. It is requested that this amendment be entered, and all pending Claims be passed to issue. If the Examiner has any questions or concerns regarding the foregoing, a call to the undersigned is encouraged and welcomed.

Respectfully submitted,

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